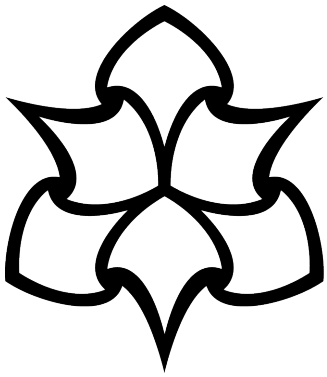

Development and Testing of a Model for Risk and Protective Factors for Eating Disorders and Higher Weight among Emerging Adults: A Study Protocol

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Abstract

Research has demonstrated that eating disorders (ED) and higher weight have lifetime co-occurrence suggesting that they may be best considered within a common etiological model. Although we know that body dissatisfaction is likely to be a risk factor for both outcomes, other proposed risk and protective factors for each condition have not been adequately explored. The current paper tests a conceptual model that is based on a review of the existing literature from both areas of scholarship. It considers biological, sociocultural, psychological, and behavioral factors that may contribute to both outcomes. The model will be tested in a longitudinal design with an initial sample of 600 emerging adults (aged 18-30) per country in nine different countries (total sample = 5400 participants). Questionnaires will be completed online on two occasions, 12 months apart. The first full phase of the study commenced in July 2018, the same time *Body Image* was approached to publish this protocol paper (the final revised paper was submitted in September 2019), and data collection will be finalized in December 2019. Multi-group path analysis will identify the biopsychosocial predictors – both cross-sectionally and longitudinally – of both ED and higher weight, and how these vary across countries and gender.

Key Words: eating disorders; higher weight; risk factors; cross-cultural; gender; model

Highlights:

- We introduce a conceptual model of risk and protective factors for eating disorders and higher weight among adults
- Our proposal will examine the utility of this model across gender and nine countries
- The proposed research design will test the nature of the model relationships longitudinally

1. Introduction

Research has consistently revealed that eating disorders (ED) and higher weight have lifetime co-occurrence (Villarejo et al., 2012). These outcomes have been shown to share sociocultural, psychological, and behavioral risk and protective factors in adolescent populations (Haines, Kleinman, Rifas-Shiman, Field, & Austin, 2010). Body image, particularly body dissatisfaction, has been shown to play a strong direct and mediating role in predicting both ED and higher weight. These findings have prompted the suggestion that ED and higher weight may be best considered within a common etiological model (e.g., Wilson, 2010). Given that ED and higher weight have high levels of co-occurrence and cause distress across genders throughout the lifespan (Grogan, 2017), it is important to better understand the shared risk and protective factors for both outcomes. However, there is limited knowledge about the nature and extent to which they share risk and protective factors. Reviews that have investigated shared risk and protective factors have highlighted similarities across separate studies regarding factors identified as related to both higher weight and ED. Notably, body dissatisfaction appears to be an important risk factor for both outcomes, and also appears to be related to a range of psychological, biological, sociocultural, and behavioral risk and protective factors for higher weight and ED. Thus, this research is grounded in a framework that positions body image as a central variable responsible for the co-occurrence of the two conditions. However, given the diffuse network of proposed risk and protective factors, and the lack of a supporting coherent framework tying the together, a stronger articulation of how these many putative risk and protective factors interact is needed to drive empirical work. The first aim of this research is therefore to propose such a conceptual model that will be useful in guiding the development of testable models of the development of ED and higher weight.

This research will also explore the role of other possible risk and protective factors – both in relation to body image and in terms of incremental predictive value beyond body image – for ED and higher weight. Other risk and protective factors that have been found to be common to ED and higher weight across studies include dieting (Stice, Gau, Rohde, & Shaw, 2017; Stice, Presnell, Shaw, & Rohde, 2005), media influence (Dennison & Edmunds, 2008; Field et al., 2008), teasing (Copeland et al., 2015; Haines, Neumark-Sztainer, Eisenberg, & Hannan, 2006), parental behaviors (Johnson, Cohen, Kasen, & Brook, 2002; Neumark-Sztainer et al., 2010), and depression (Stice et al., 2005; Stice, Presnell, & Spangler, 2002). In line with the above findings, several reviews have argued for prevention programs that target both ED and higher weight (Golden, Schneider, & Wood, 2016; Haines

& Neumark-Sztainer, 2006; Rancourt & McCullough, 2015), and Neumark-Sztainer and colleagues (Neumark-Sztainer, 2003, 2005, 2009; Neumark-Sztainer, Wall, Story, & Sherwood, 2009) have repeatedly discussed the ways in which approaches to prevention of both ED and higher weight may be integrated. However, before the successful integration of prevention approaches can be achieved, it is important to establish a thorough understanding of the most significant risk and protective factors that are common to both ED and higher weight. This protocol paper is designed to present (a) the background for and articulation of the conceptual model underpinning the research, and (b) the methodology adopted to determine the role of body image and other risk and protective factors in the development of ED and higher weight. Reporting study protocols in advance allows the scientific community to evaluate whether the eventual analysis and results are consistent with the investigators' original intent. Showing that the study has a specific design in advance based on a theoretical rationale also contributes to greater transparency. Making study protocols publicly available has the benefit of disseminating the most contemporary ideas with respect to study design and data analysis, and helps to avoid duplication and to better coordinate research efforts.

The conceptual model and empirical research outlined in this paper focuses on the period of emerging adulthood. This period occurs between the ages of 18 and 30 years, and is a particularly important stage of development for both ED and higher weight (Arnett, Žukauskienė, & Sugimura, 2014). During this stage of development, emerging adults are engaged in identity formation, experience high levels of anxiety and depression, experience instability in terms of their relationships and unemployment, express a high level of self-focus, and feel "in-between" adolescence and adulthood (Arnett et al., 2014). There is evidence that increasing weight gain during emerging adulthood is associated with higher mortality rates in later life compared with men and women who gain weight in later adulthood (Adams et al., 2013). This association is concerning given that emerging adulthood is generally a time of rapid increase in weight (Ng et al., 2014). Similarly, the prevalence rates of ED are significantly higher in emerging adults than older adults (Preti et al., 2009). As such, this study will particularly focus on developing a model of ED and higher weight in young adults aged 18 years to 30 years.

The findings from the above literature which was designed to identify shared risk and protective factors for ED and higher weight are limited in several ways. Comparisons of identified risk and protective factors across studies are impeded by differences in populations, outcome variables, methodologies, time-frames, and analytic approaches (Haines et al., 2010). As suggested by Neumark-Sztainer, Wall, et al. (2007), these difficulties can be

overcome by a comprehensive examination of risk and protective factors for ED and higher weight within a single study. Neumark-Sztainer, Wall, et al. (2007) and Haines et al. (2010) examined the prevalence and co-occurrence of higher weight, binge eating, and extreme weight-control behaviors in adolescents, as well as a comprehensive range of factors that had the potential to increase or decrease participants' risk of weight-related and behavioral outcomes. Both Neumark-Sztainer, Wall, et al. (2007) and Haines et al. (2010) identified shared socioenvironmental, personal, psychological, and behavioral risk and protective factors for these three outcomes. A limitation of these studies, however, is that they did not examine how these factors may vary across gender, and there is no evidence regarding whether the models apply in different countries. One of the important advantages of including participants from a range of different countries is establishing the usefulness of the model beyond the handful of countries where studies of body image have tended to be focused, hence ensuring broader generalizability than has been possible in previous work. Further, the focus has been on the development of ED and higher weight among adolescents. Recently, developmental researchers have demonstrated historical trends towards a longer period of adolescence than previously defined (up to 24 years), characterized by later onset of developmental milestones in both adolescence and adulthood, longer duration of developmental uncertainty and latent risk periods extending into early adulthood (Sawyer, Azzopardi, Wickremarathne, & Patton, 2018). Thus, although the focus in risk and development research in ED and higher weight has focused on a more narrowly defined developmental window, this emerging work suggests the need to consider beyond the age of 18 as a continued – though underexplored – risk window. To date, no research has examined a model for shared factors for ED and higher weight among adults.

The aim of the current research project is to develop a conceptual model representing shared risk and protective factors for ED and higher weight in young adults and empirically examining this model in large samples of women and men from different cultures. The development of the current model was primarily based on the previous work of Neumark-Sztainer, Haines, et al. (2007) and Haines et al. (2010) (see Figure 1). These studies, as well as other studies reviewed above, informed the central variables included as well as the direction of the relationships between these variables. This conceptual model is now open to evaluation through the methodology described in this paper.

This project addresses three key research questions:

1. What are the unique and common risk and protective factors that contribute to ED as well as higher weight in emerging adults?
2. What are the unique and common risk and protective factors for men and women?
3. What are the unique and common risk and protective factors across countries?

2. Method

2.1. Design

There are tensions in the literature regarding the social construction of obesity and the concept of an ideal weight, as evidenced by a review conducted by Gotovac, LaMarre, and Lafreniere (2018). Further, a focus on obesity in healthcare has been shown to promote weight stigma (Alberga, McLaren, Russell-Mayhew, & von Ranson, 2018), where overweight males and females are discriminated against due to their weight. This alienation can present problems with patient engagement with health professionals, such as the avoidance of seeking preventative care and medical treatment (Mensinger, Tylka, & Calamari, 2018; Spooner, Jayasinghe, Faruqi, Stocks, & Harris, 2018). Additionally, a high BMI may not reflect high levels of obesity, but rather indicate a high level of muscle mass (Okorodudu et al., 2010). Due to these problems, as well as with the use of the term "obesity," a weight neutral position has been adopted for this study protocol and the term "higher weight" has been employed.

Given the lack of model development for ED and higher weight among adults, a conceptual model was developed on the basis of the existing models to explain ED and higher weight in adolescence. The sociocultural, psychological, and behavioral risk and protective factors are expected to have bi-directional effects on one another, as well as uni-directional effects on the outcomes. The demographic and biological risk and protective factors are expected to have uni-dimensional associations with the sociocultural, psychological, and behavioral factors, as well as the outcomes (see Figure 1).

This research project is a cross-institutional international collaboration, with research teams from the following nine countries simultaneously collecting data: Australia, Belgium, Canada, China, Italy, Japan, Spain, United Kingdom, and the United States of America (Northeast). The model for ED and higher weight risk and protective factors will be compared across countries to examine how the model functions for adults in different countries (see Data Analysis Plan subsection, below). As this collaboration has the explicit goal of bringing together historically separate areas of scholarship, the resulting conceptual model includes

variables that represent concepts across a variety of perspectives. As such, the model includes body mass index and other variables that stem from the dominant medical model. However, it also includes variables that are grounded in weight-neutral and weight inclusive models including weight-based stigmatization and positive body image. In addition, examining sociocultural factors and locations across a number of dimensions will allow for the consideration of intersecting identities.

The variables (and the instruments to evaluate these variables) were determined through a consensus process among the 28 authors of this paper who represent experts in the area of body image, ED, and higher weight across nine countries. This consensus process involved two face-to-face meetings a year apart (in Sicily and Canada) as well as email contact between these two meetings to refine the list of variables and measures. It was difficult to ensure that the survey was kept to a manageable size. Ultimately, the selection of the variables was determined by the level of support from the literature in relation to the contribution to both ED and higher weight.

2.2. Participants

Participants (n = 600; 300 males, 300 females per country, for a total of 5400 participants across the nine countries) will be adults aged between 18 and 30 years living within the general community. Pregnant women will be excluded from participation, given that pregnant women's experiences of their body may be different from women who are not pregnant (Watson, Broadbent, Skouteris, & Fuller-Tyszkiewicz, 2016; Watson, Fuller-Tyszkiewicz, Broadbent, & Skouteris, 2015).

2.3. Measures

2.3.1. Demographic and background information. Demographic information will be collected, including participants' age, sex, gender identity, sexual orientation, relationship status, perceived socio-economic status, employment, education (i.e., years of education completed and current study status), country of birth, and racial and ethnic identity. In addition, data will be collected on the participants' neighborhood, including current location (i.e., country, state, and postcode), living situation, and perceptions of the neighborhood for safety and accessibility of fresh and healthy food.

2.3.2. Outcomes.

2.3.2.1. Body mass index (BMI). Participants' self-reported height and weight will be recorded for BMI (calculated as weight kg/height m^2). Self-reported weight and height information has been shown to correlate significantly with researcher-measured

anthropometric information (correlation of .90+; Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987; Castro Markey & Gesner, 1999).

2.3.2.2. Drive for muscularity. The Drive for Muscularity Scale (DMS; McCreary & Sasse, 2000; McCreary, Sasse, Saucier, & Dorsch, 2004), a 15-item self-report measure, will be used to assess level of preoccupation with increasing muscularity. Example items from the scale include: "I think I would feel more confident if I had more muscle mass" and "I think I would feel stronger if I gained a little more muscle mass." Participants respond to items on a 6-point scale, ranging from 1 (*always*) to 6 (*never*). All items are reverse-scored such that the score reflects greater drive for muscularity. The items are averaged to produce a score of drive for muscularity (ranging from 1-6), where higher scores are indicative of a greater drive for muscularity. Scores on the DMS demonstrated excellent internal consistency when tested with a sample of adult men and a sample of adult women (McCreary et al., 2004).

2.3.2.3. Drive for leanness. The Drive for Leanness Scale (DLS; Smolak & Murnen, 2008), a 6-item self-report measure, will be used to assess the level of preoccupation with increasing leanness (i.e., having relatively low body fat and toned muscles). Example items from the scale include: "When a person's body is hard and firm, it says they are well-disciplined" and "I think the best looking bodies are well-toned." Participants indicate the frequency with which they engage in these thoughts by responding to items on a 6-point scale, ranging from 1 (*never*) to 6 (*always*). A total score is produced by summing together the scores for each item (ranging from 6-36), with higher scores indicative of higher drive for leanness. Scores on the DLS demonstrated good internal consistency within a sample of adult men and a sample of adult women (Smolak & Murnen, 2008).

2.3.2.4. Eating pathology. Eating pathology, such as restrained eating, bingeing, and purging will be assessed with relevant subscales from the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn, Cooper, & O'Connor, 2008). Restrained eating will be assessed with the 5-item Restrained Eating subscale, with items including "Have you tried to follow definite rules regarding your eating in order to influence your shape or weight?" Participants rate items according to how many days they experienced the symptom within the past 28 days, with the 7-point scale ranging from 0 (*no days*) through to 6 (*every day*). Subscale items are averaged together to produce a global score of restrained eating (ranging from 0-6), where higher scores are indicative of higher frequency of days for restrained eating. Scores on the Restrained Eating subscale demonstrated excellent internal consistency when tested in a community representative sample of adult females (Mond, 2004).

Bingeing and purging will be assessed with the 5-item Bingeing and Purging subscale of the Eating Disorder Examination Questionnaire (Fairburn et al., 2008). The items ask participants to specify the number of days in the past 28 days when they have engaged in the bingeing or purging behavior. Example items from the subscale include, "Having a sense of having lost control over your eating at the time of your eating" and "Taken laxatives as a means of controlling your shape or weight." For the purpose of the current study, the original Bingeing and Purging subscale was revised to include two additional items to assess the consumption of food supplements and steroids as a means of controlling shape and weight. Each item on the revised Bingeing and Purging subscale is scored individually as follows: participants are classified as evidencing Bingeing behavior if they responded "one or more times" to both eating an unusually large amount of food as well as evidencing a loss of control within the last 28 days. Participants are classified as evidencing Purging behavior if they responded "one or more times" to any of the three purging behaviors (vomiting, laxative use, diet pills/diuretics) or excessive exercise within the last 28 days.

2.3.3. **Biological factors.**

2.3.3.1. Pubertal timing. Pubertal timing will be assessed with a single item asking participants when they started puberty compared to their peers. Participants will rate the item on a 10-point scale, ranging from 1 (*started much earlier*) to 10 (*started much later*). A subjective measurement of pubertal timing will be used, because it has more personal meaning to the individual compared to an objective measure related to the pubertal timing among a normative sample (McCabe & Ricciardelli, 2004).

2.3.3.2. Individual history of weight and disordered eating. Participants will respond to a number of items regarding their history of weight and disordered eating. History of an eating disorder will be assessed with participants responding (*yes/no*) to the item "Have you ever been told by a health professional (e.g., a doctor, nurse, or a psychologist) that you have an eating disorder?" If participants endorse a history of an eating disorder, they will respond to a second item to specify the type of eating disorder (i.e., anorexia nervosa, bulimia, binge eating disorder, and eating disorder not otherwise specified). Participants will respond (*yes/no*) to a single item to endorse whether there are any medical conditions or factors that have influenced their weight. Typical weight during childhood will be assessed using a single item with participants responding to the question "What was your typical weight in childhood (under the age of 12)?" on a 10-point scale ranging from 1 (*very underweight*) to 10 (*very overweight or obese*). In addition, participants will respond to two items about their weight

fluctuations, recording their highest weight and lowest weight (kg) since they have reached their current height.

2.3.3.3. Family history of weight and disordered eating. Participants will respond to a number of items regarding their family history of weight and disordered eating. Diagnosis of an eating disorder for members of the biological family will be assessed with participants responding (*yes*/*no*) to the item "Has anyone in your immediate family (biological) been diagnosed with an eating disorder?" If participants endorse a diagnosis of an eating disorder in their biological family, they will respond to a second item to specify the type of eating disorder (i.e., anorexia nervosa, bulimia, binge eating disorder, and eating disorder not otherwise specified). Participants will respond (*yes/no*) to a single item to endorse whether any members of their biological family are obese. In addition, participants will respond to two items about the typical weight of their biological mother and biological father. Participants will rate items on a 10-point scale for their perception of the typical weight, ranging from 1 (*very underweight*) to 10 (*very overweight or obese*). An option to select *unknown or non-applicable* will be provided for those participants who are unable to respond to the items.

2.3.4. Sociocultural factors.

2.3.4.1. Social media and online dating platforms use. Participants will respond to a single item to indicate their use of social media platforms (*yes/no*), including: Facebook, Instagram, MySpace, Twitter, Snapchat, Periscope, Tumblr, and 'other.' If participants respond yes, they will then indicate the total amount of time spent using social media platforms in a week. Response options range from < *60 minutes* to > *21hours*. Participants will indicate their use of online dating platforms for dating by responding (*yes/no*) to a single item that asks whether they have any accounts with online platforms for dating, such as Tinder, Bumble, grindr, Her, happn, coffee meets bagel, or OkCupid. If participants respond yes, they will then indicate the total amount of time spent using online dating platforms in a week. Response options range from < *60 minutes* to > *21hours*.

2.3.4.2. Sociocultural influences on body image. The Perceived Sociocultural Influences on Body Image and Body Change Questionnaire (McCabe & Ricciardelli, 2001) will be used to assess the perceived encouragement from others to engage in body change strategies. The scale was adapted to include 18-items focused on the mother, father, and peers as specific sources of influence. Example items from the scale include: "My mother encourages me to lose weight," "My father teases me about having no muscles," and "My peers diet to lose weight or keep from gaining weight." Participants will indicate their

agreement with items on a 5-point scale ranging from 1 (*never*) to 5 (*always*). The subscale items assessing mother, father, and peer influence are averaged to produce a score of perceived influence from the specific source (ranging from 1-5), where higher scores are indicative of higher perceived sociocultural pressure. This scale has demonstrated a high level of internal consistency with an adolescent sample (McCabe & Ricciardelli, 2001).

2.3.4.3. Media influence on body image. The influence of media on body image will be assessed with the 9-item Perceived Sociocultural Influences on Body Image and Body Change Questionnaire- Media Influences subscale (McCabe & Ricciardelli, 2001). Example items from the scale include: "To what extent do you think that media (television, movies, magazines, newspapers, the Internet, and social media) give the idea that you should exercise more to lose weight?" and "To what extent do you think that media (television, movies, magazines, newspapers, the Internet, and social media) give the idea that you should be more muscular?" Participants indicate their agreement with items on a 5-point scale ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). Subscale items are averaged together to produce a global score of media influence (ranging from 1-5), where higher scores are indicative of greater perceived influence from the media to change appearance and the body. This scale has demonstrated a high level of internal consistency with an adolescent sample (McCabe & Ricciardelli, 2001).

2.3.5. Psychological factors.

2.3.5.1. Body satisfaction. The Multidimensional Body Self Relations Questionnaire-Body Area Satisfaction Scale (BASS; Brown, Cash, & Mikulka, 1990; Cash, 2000) will be used to assess body satisfaction associated with specific body areas and attributes. The BASS consists of nine items which relate to specific body areas, for example "face (facial features, complexion)," "lower torso (buttocks, hips, thighs, legs)," and "upper torso (chest or breasts, shoulders, arms)." Participants respond to items on a 5-point scale, ranging from 1 (*very dissatisfied*) to 5 (*very satisfied*). A global score of body satisfaction is produced by averaging the items (ranging from 1-5), with higher scores indicative of greater body satisfaction. Scores on the BASS demonstrated good internal consistency when tested for a sample of adult males and a sample of adult females (Cash, 2000).

2.3.5.2. Weight and shape concern. The Weight Concern (5 items) and Shape Concern (8 items) subscales of the Eating Disorder Examination Questionnaire (Fairburn et al., 2008) will be used to assess level of concern related to body weight and shape. Example items from the subscales include: "On how many of the past 28 days have you had a strong desire to lose weight?" (Weight Concern subscale); and "Over the past 28 days how

uncomfortable have you felt seeing your body (for example seeing your shape in the mirror, in a shop window reflection, while undressing or taking a bath or shower)?" (Shape Concern subscale). Participants respond to items according to their level of preoccupation with the weight concern or shape concern (indicated by their behaviors, thoughts, and feelings) within the past 28 days, with the 7-point scale ranging from 0 (*no days/not at all*) to 6 (*every day/markedly*). Subscale items are averaged to produce a global score of weight concern and shape concern (ranging from 0-6), where higher scores are indicative of greater concern for one's body weight and shape. Scores on the Weight Concern and Shape Concern subscales demonstrated excellent internal consistency when tested in a community representative sample of adult females (Mond, 2004).

2.3.5.3. Body appreciation. Body appreciation (i.e., favorable opinions and treatment of one's body despite perceived appearance flaws) will be assessed using the 10-item Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015). Participants consider the BAS-2 items for how true the statements are for them, for example "I feel love for my body." Participants respond to the items on a 5-point scale, ranging from 1 (*never*) to 5 (*always*). The 10 items are averaged to produce a score of body appreciation (ranging from 1-5), where higher scores are indicative of greater body appreciation. Scores on the BAS demonstrated excellent internal consistency and good convergent validity with measures of body image, eating disorder symptomatology, coping, and self-esteem when tested with samples of college and online community adult women and men (Tylka & Wood-Barcalow, 2015).

2.3.5.4. Internalization of the thin and muscular ideals. Internalization of the thin and muscular ideals will be assessed using relevant subscales from the Sociocultural Attitudes Towards Appearance Questionnaire-4 (Schaefer et al., 2015), specifically the Internalization Thin/Low Body Fat subscale (5 items) and the Internalization Muscular/Athletic subscale (5 items). Examples of the subscale items include: "I want my body to look very thin" (Internalization Thin/Low Body Fat subscale) and "I spend a lot of time doing things to look more athletic" (Internalization Muscular/Athletic subscale). Participants indicate their agreement to the items on a 5-point Likert scale according to their level of agreement with the statement, ranging from 1 (*definitely disagree*) to 5 (*definitely agree*). A global score of internalization thin/low body fat is produced by averaging the subscale items, where higher scores are indicative of greater internalization of the thin ideal. A global score of internalization muscular/athletic is produced by averaging the subscale items (ranging from 1-5), where higher scores are indicative of greater internalization of the muscular ideal. The Internalization Thin/Low Body Fat subscale and Internalization

Muscular/Athletic subscale scores demonstrated excellent internal consistency and good convergent validity with measures of body image, eating disturbance, and self-esteem when tested for a sample of adult males and a sample of adult females (Schaefer et al., 2015).

2.3.5.5. Internalization of weight bias. Weight bias (i.e., the degree to which individuals base their self-evaluations on their weight and apply weight-based stereotypes to themselves) will be assessed using the 11-item Modified Weight Bias Internalization Scale (Pearl & Puhl, 2014). Example items from the scale include: "I am less attractive than most other people because of my weight" and "I feel anxious about my weight because of what people might think of me." Participants respond to items by indicating their level of agreement with each statement using a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). All items are averaged to produce a global score of internalization of weight bias (ranging from 1-7), where higher scores are indicative of higher internal bias. Scores on the WBIS-M demonstrated excellent internal consistency when tested with samples of adult men and women (Pearl & Puhl, 2014).

2.3.5.6. Physical appearance comparison. The 5-item Physical Appearance Comparison Scale (PACS; Thompson, Heinberg, & Tantleff, 1991) will be used to measure the tendency to compare one's physical appearance to the physical appearance of others. Example items from the scale include: "At parties or other social events, I compare my physical appearance to the physical appearance of others" and "At parties or other social events, I compare how I am dressed to how other people are dressed." Participants rate the frequency of comparisons on a 4-point scale, ranging from 1 (*never*) to 4 (*always*). A total score is produced by summing together the scores for each item (ranging from 5-20), with higher scores indicative of a greater tendency to engage in physical appearance comparison. Scores on the PACS demonstrated good internal consistency when tested with a sample of adult female university students (Fitzsimmons-Craft, Bardone-Cone, & Harney, 2012).

2.3.5.7. Impulsivity. Impulsivity will be assessed with the 4-item Negative Urgency subscale of the SUPPS-P Impulsive Behaviour Scale (Cyders, Littlefield, Coffey, & Karyadi, 2014). Example items from the scale include: "When I am upset, I often act without thinking" and "When I feel bad, I will often do things I later regret in order to make myself feel better now." Participants indicate their agreement with items on a 4-point scale, ranging from 1 (*strongly agree*) to 4 (*strongly disagree*). A global score of impulsivity is produced by summing together the scores for each item (ranging from 4-16), with higher scores indicative of greater levels of impulsivity. Scores on the Negative Urgency subscale demonstrated good

internal consistency in a sample of adult undergraduate university students (Cyders et al., 2014).

2.3.5.8. Perfectionism. Perfectionism will be assessed using the shortened form of the Hewitt and Flett Multidimensional Perfectionism Scale (Hewitt & Flett, 1991; Stoeber, 2016), a scale tapping into different aspects of perfectionism as a multidimensional construct (i.e., self-oriented perfectionism, socially prescribed perfectionism, and other oriented perfectionism). The Self-oriented Perfectionism subscale (5 items) measures participants' beliefs that being perfect and striving for perfection is important, while the Socially Prescribed Perfectionism (5 items) measures participants' beliefs that being perfect and striving for perfection is important to others. Example items from the subscales include: "I strive to be as perfect as I can be" (Self-oriented Perfectionism subscale) and "People expect nothing less than perfection" (Socially Prescribed Perfectionism subscale). Participants respond to items by indicating their level of agreement with the statements on a 7-point scale ranging from 1 (*disagree*) to 7 (*agree*). The subscale items are summed to produce a total score of self-oriented perfectionism and socially prescribed perfectionism (ranging from 5-35), with higher scores indicative of more maladaptive perfectionistic attitudes and behaviors. Scores on the Self-oriented Perfectionism and Socially Prescribed Perfectionism subscales both demonstrated good internal consistency among a sample of adult women (Stoeber, 2016).

2.3.5.9. Self-esteem. The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965) will be used to assess the self-esteem of participants. A short form of the RSES which includes only the five positively worded items will be used (Tambs & Roysamb, 2014). Example items from the scale include: "I feel that I have a number of good qualities" and "I take a positive attitude toward myself." Participants indicate their agreement with items on a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The items are summed to produce a global score of self-esteem (ranging from 5-20), with higher scores indicative of higher levels of self-esteem. Scores on this shortened form of the RSES have demonstrated excellent internal consistency for a sample of young adults (Tambs & Roysamb, 2014).

2.3.5.10. Depressive symptoms. The screening of depressive symptoms will be completed with the Patient Health Questionnaire- 2 (PHQ-2; Kroenke, Spitzer, & Williams, 2003), a 2-item self-report measure assessing frequency of depression symptoms over the past seven days. The two items assessed "declined interest or pleasure" and "depressed or down mood." Participants rate items on a 4-point scale ranging from 0 (*not at all*) to 3 (*nearly every day*). The items are summed to produce a global score of depressive symptoms

(ranging from 0-6), with higher scores indicative of greater depressive symptoms. A total score exceeding the cut-off of three suggests that depressive symptoms are present. Scores on the PHQ-2 exhibited excellent criterion validity, with 82.9% sensitivity and 90.0% specificity for major depression in a sample of adults accessing primary care (Kroenke et al., 2003).

2.3.5.11. Social anxiety symptoms. The screening of social anxiety symptoms will be conducted with the shortened form of the Social Interaction Anxiety Scale (SIAS-6; Peters, Rapee, Sunderland, Andrews, & Mattick, 2012). The scale consists of six items. Participants report the degree to which the SIAS-6 items are true for them, for example, "I find it difficult to mix comfortably with the people I work with." Participants indicate their agreement with the items on a 5-point scale, ranging from 0 (*not at all characteristic or true of me*) to 4 (*extremely true of me*). The items are summed to produce a total score of social anxiety symptoms (ranging from 0-24), where higher scores are indicative of greater social anxiety symptoms. Scores on the SIAS-6 demonstrated good internal consistency for a sample of patients with social anxiety disorder and a control sample of individuals without anxiety (Le Blanc et al., 2014).

2.3.5.12. Experience of trauma. The screening of trauma symptoms will be completed with the Post-Traumatic Stress Disorder Checklist for DSM-5 (PCL; Weathers et al., 2013). The PCL has individual subscales tapping into different clusters of trauma symptoms, specifically re-experiencing, avoidance, negative alterations in cognitions and mood, and hyperarousal. In the current study, the 6-item hyperarousal subscale will be utilized, with the items assessing symptoms such as irritability, hypervigilance, risk taking, difficulties with concentration, and disturbed sleep. Participants indicate how frequently they have been bothered by each symptom within the past month using a 5-point scale ranging from 0 (*not at all*) to 4 (*extremely*). The subscale item scores are summed to yield a total score of symptom severity for the symptom cluster of hyperarousal (ranging from 0-24).

2.3.6. Behavioral factors.

2.3.6.1. Consumption of fried foods. A single item will be used to assess the frequency of consumption of fried foods per week. Participants respond to the question "How often do you eat fried foods away from home (like French fries)?" Participants rate the frequency of consumption on a 4-point scale, ranging from 1 (*never or less than once per week*) to 4 (*daily*).

2.3.6.2. Consumption of sugary drinks. A single item will be used to assess the frequency of consumption of sugary drinks per week. Participants respond to the question "How many times each week (including weekdays and weekends) do you drink sugary drinks

(e.g., soft drinks, cordial, fruit juice)?" Participants rate the frequency of consumption of a 6-point scale, ranging from 1 (*never or almost never*) to 6 (*> or equal to three times per week*).

2.3.6.3. Consumption of breakfast. A single item will be used to assess the frequency of consumption of breakfast per week. Participants respond to the question "How many times each week (including weekdays and weekends) do you eat breakfast?" Participants rate the frequency of consumption using a 5-point scale, ranging from 1 (*never or almost never*) to 5 (*daily*).

2.3.6.4. Alcohol consumption. The screening tool, the Alcohol Use Disorders Identification Test (AUDIT; Babor & Grant, 1989), will be used to assess alcohol consumption. The current study uses the three items from the screening tool that focuses exclusively on alcohol consumption, with items pertaining to indicators of hazardous and harmful alcohol use removed. Frequency of alcohol consumption will be assessed with a single item, "How often do you have a drink containing alcohol?" Participants rate the frequency of consumption on a 5-point scale, ranging from 0 (*never*) to 4 (*4 or more times a week*). Typical quantity of alcohol consumed will be assessed with a single item, "How many drinks containing alcohol do you have on a typical day when you are drinking?" Participants rate the amount of alcohol consumed (in standard drinks) on a 5-point scale, ranging from 0 (*1 or 2*) to 4 (*10 or more*). Lastly, frequency of binge drinking will be assessed with a single item, "How often do you have six or more drinks on one occasion?" Participants rate the frequency on a 5-point scale, ranging from 0 (*never*) to 4 (*daily or almost daily*).

2.3.6.5. Tobacco consumption. A single item will be used to assess the use of tobacco. Participants respond (*yes/no*) to the question "Do you currently smoke tobacco or e-cigarettes?"

2.3.6.6. Sleep quality. The Pittsburgh Sleep Quality Assessment (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) will be used to assess the quality and pattern of sleep during the previous month. Specific to this study, sleep duration and subjective sleep quality will be assessed, with items pertaining to reasons for sleep interruption removed. Participants record a total number of hours in response to two questions, "How many hours of actual sleep did you get at night?" and "How many hours were you in bed?" These data are used to produce a rate of habitual sleep efficiency (i.e., the percentage of time spent in bed that one is asleep). Subjective sleep quality will be assessed with a single item (i.e., "During the past month, how would you rate your sleep quality overall"), with participants rating their sleep quality on a 4-point scale, ranging from 0 (*very good*) to 3 (*very bad*).

2.3.6.7. Physical activity. The Global Physical Activity Questionnaire (Armstrong & Bull, 2006), a 16-item measure, will be used to assess the frequency (*days*) and duration (*minutes/hour*) of moderate and vigorous intensity physical activity within three domains: (1) at work, (2) travel to/from places, and (3) at leisure (i.e., recreational activities). Participants respond to items about their physical activity in a 'typical' week by indicating whether they engaged in the physical activity specified (*yes/no*), the frequency of engagement in the physical activity (*number of days*), and the duration of the physical activity specified (*hours and minutes/day*). A sum total is created for participants who answered yes to engaging in physical activity based on the minutes engaged in physical activity multiplied by the average number of days per week engaged in physical activity.

2.3.6.8. Body change strategies. Three scales from the Body Change Inventory (BCI; Ricciardelli & McCabe, 2002) will be used in the current study: Strategies to Decrease Body Size (6 items), Strategies to Increase Body Size (6 items), and Strategies to Increase Muscle Size (6 items). Examples of the items from the subscales include: "How often do you think about changing your levels of exercise to decrease your body size?", "How often do you worry about changing your eating to increase your body size?", and "How often do you change your food supplements to increase the size of your muscles?" Participants respond to items on a 5-point scale, ranging from 1 (*never*) to 5 (*always*). Total scores are obtained by adding responses to items for each of the subscales (ranging from 6-30), where higher scores are indicative of higher levels of each construct. These scales have been shown to have high level of internal consistency with an adolescent sample (McCabe & Ricciardelli, 2002).

2.3.6.9. Intuitive eating. Intuitive eating will be assessed using the Reliance on Hunger and Satiety Cues (RHSC) subscale of the Intuitive Eating Scale-2 (Tylka & Kroon Van Diest, 2013). The 6-item RHSC subscale measures participants' trust in their internal cues to guide their eating behaviors. Example items from the subscale include: "I trust my body to tell me what to eat" and "I rely on my hunger signals to tell me when to eat." Participants respond to the items by indicating their level of agreement with the statements on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Items are averaged to produce a total subscale score (ranging from 1-5), where higher scores are indicative of greater reliance on hunger cues and satiety to guide eating. Scores on the RHSC subscale have demonstrated excellent internal consistency and construct validity when tested with a sample of adult women and a sample of adult men (Tylka & Kroon Van Diest, 2013).

2.3.6.10. Emotional eating. Emotional eating will be assessed using the Emotional Eating subscale of the Three Factor Eating Questionnaire (Cappelleri et al., 2009). The 6-item

Emotional Eating subscale measures participants' experiences of overeating in response to negative affective states. Example items from the subscale include, "I start to eat when I feel anxious" and "When I feel tense or 'wound up,' I often feel I need to eat." Participants respond to items on a 4-point scale ranging from 1 (*definitely true*) to 4 (*definitely false*). A total subscale score of emotional eating is produced by first reverse scoring all subscale items and then averaging the scores (ranging from 1-4), with higher scores indicative of more overeating during dysphoric mood states. Scores on the Emotional Eating subscale have demonstrated excellent internal consistency when tested with a sample of overweight and obese adult participants (Cappelleri et al., 2009).

2.4. Procedure

The questionnaire will be translated and back translated to ensure that the wording is appropriate for participants in Canada (English and French speaking, analyzed separately), China, Italy, Japan, and Spain. Several of the questionnaires have been already translated and validated in the various non-English languages (i.e., Chinese, Dutch, French, Italian, Spanish, and Japanese). The other questionnaires will be translated into the target language based on the original English version. This will be done in line with the recent recommendations of Swami and Barron (2018). Therefore, the English original version of each questionnaire will be first translated into the target language by an uninformed professional translator (whose English is their first language) and then discussed by an expert committee (comprising psychometricians, body image researchers, bilingual researchers, and the two translators). The committee will also consider whether or not the items in the translated version of the measure will be understandable to participants. The translated items validated by the committee will then be back-translated into English by a second uninformed professional translator (where the target language is their first language). This back translation will then be compared, by the expert committee, with the original English version. Any inconsistencies between versions will be discussed in committee, and this process will be repeated until both versions are considered as semantically equivalent. Testing for measurement invariance across the nine countries, as well as conducting confirmatory factor analysis will be conducted (see Analysis section) on the scales. This process could lead to a reduced version of the scales that is valid across all countries.

Potential participants will view recruitment materials advertised via social media sites (e.g., Facebook), online forums, and mailing lists. The recruitment materials will provide details of what is required for participation in the study and a weblink to access the online questionnaire. The weblink will direct potential participants first to further information on the

research project (i.e., Plain Language Statement; PLS) in order to make an informed decision about study participation. Participants who provide their consent online proceed to the online questionnaire. Completion of the full questionnaire will take approximately 60-90 minutes. On completion of the baseline (T1) questionnaire participants will be invited to provide their email address should they wish to take part in a second time point (T2). Participants who are interested in entering a draw for the opportunity to win a prize for participation will also provide their email address. Participants were informed that such a draw would also occur at the second time point. Participants who consented to be contacted, will receive an email invitation to the T2 survey, 12 months after completing the baseline (T1) survey. Initial data collection for the whole sample commenced in July 2018, concurrent with the initial submission of this protocol paper (the final revised paper was submitted in September 2019), and the data collection will be finalized in December 2019.

2.5. Data Analysis Plan

2.5.1. Sample size. A target sample of 600 participants per country (and 300 per gender within-country) has been estimated to ensure sufficient sample size both from global and local model fit perspectives within-country to run structural equation modeling-based analyses designed to test the proposed model. This is a total number of 5000+ participants. Assuming alpha is set at .05 (two-tailed) and power at .80, 300 per group is sufficient to detect small, non-trivial group differences of magnitude Cohen's $d > 0.20$ or a coefficient within the overall model with Cohen's $f > .16$ ($R^2 \sim .025$) (Cohen, 1988). Further, 300 participants per group has power > .95 to detect poor overall model fit, defined as RMSEA = .05 relative to RMSEA = .01 (MacCallum, Browne, & Sugawara, 1996).

2.5.2. Missing data. Missing data will be handled using full-information maximum likelihood. Given the untestable assumption of maximum likelihood that data are missing at random, sensitivity analyses will be completed to explore the effect of departure from this assumption on parameter estimates within our conceptual model.

2.5.3. Analysis. In addition to efforts in the translation of some of our measures, comparability of psychometric properties of the various measures across countries will be evaluated statistically. As plausible and previously validated factor structures have been published for all measures, multigroup confirmatory factor analyses will be conducted as a preliminary step to confirm the original factor structures and their equivalence across groups. In the case of multi-dimensional instruments, a hybrid exploratory/confirmatory approach exploratory structural equation modelling (SEM; Asparouhov & Muthén, 2009) will be used to confirm the original factor structures and their equivalence across groups. This ESEM

approach has the advantage of permitting exploration of ways to improve model fit beyond the a-priori factor structures intended for testing (Swami & Barron, 2018). Solutions for non-equivalence in measurement will be sought as needed, such as the alignment method (Asparouhov & Muthén, 2014).

Subsequent to measurement modelling and based on the conceptual model (Figure 1), testable models will be refined through a process of theory and data driven steps. Variables that share conceptual and empirical commonality within broad factors (for example, sociocultural appearance messages; Morin & Maïano, 2011) will be combined into latent variables. In addition, based on the patterns of relationships observed in the data, more parsimonious models including specific outcomes, or combinations of outcomes, will be developed and tested.

These models will include several of the demographic variables, biological, behavioral, psychological, and sociocultural factors) and outcome variable. The models will follow the same directionality to the one presented in Figure 1. Nevertheless, based on the aforementioned refinement process, only a subset of the variables used to measure demographics, factors or the outcomes will be examined.

Based on the complexity of the models examined and the number of parameters used to measure demographics, factors and outcomes, several strategies will be used to estimate variables of interest. For example, these models will include a combination of observed variables, latent variables (estimated using manifest indicators) or latent factor scores saved from preliminary measurement models (i.e., confirmatory factor analyses or exploratory factor analyses) using the FSCORES command available in the Mplus Software (Muthén & Muthén, 2017).

Multi-group path analysis will then be undertaken to test the model simultaneously across the nine countries. This analysis will proceed in two runs. First, parameter estimates will be allowed to vary across groups (i.e., the magnitude of relationship between two specific variables may take on different values across countries). Following recommended criteria, non-significant chi square value ($p > .05$), comparative fit index (CFI) values above .96, root mean squared error of approximation (RMSEA) below .05, and standardized root mean residual (SRMR) below .05 will be used to indicate good model fit; and chi square $p < .01$, CFI $\geq .95$, RMSEA $< .08$, and SRMR $< .10$ as acceptable fit (Schermelleh-Engel, Moosbrugger, & Müller, 2003).

In a second run, the parameters will be constrained to equality across countries (i.e., the same relationship must take on the same value across all groups), and model fit will be

reassessed. Comparison of chi-square, CFI, and RMSEA values for the unconstrained and constrained models will be used to evaluate the extent to which model fit is worsened by forcing the same model across groups. A significant difference in chi square estimates ($p <$ .05) indicates statistically significant worsening of model fit by constraining the model across groups. However, as chi square is sensitive to sample size and even minor departures from normality (Curran, West, & Finch, 1996), worsening of model fit will also be inspected from a practical significance perspective as suggested by Gregorich (2006). Change in CFI greater than .01 indicates practically significant worsening of fit when constraints are imposed on the model (Cheung & Rensvold, 2002). In the current context, that would indicate that the model differs across countries. Inspection of modification indices will be used to identify sources of misfit.

3. Discussion

This paper provides a description of a proposal to evaluate the predictors of both ED and higher weight among young adult men and women in nine different countries. The variables included in this conceptual model have been identified in the literature as being consistent predictors of ED and higher weight among men and/or women. The way in which these variables relate to ED and higher weight will be determined. For example, although body dissatisfaction has been shown to be related to both ED and higher weight, it is not clear whether the mechanism of action is the same for both outcomes. The model includes demographic, biological, sociocultural, psychological, and behavioral variables. The value of this research lies in its capacity to identify common as well as unique predictors of ED and higher weight. Body image is a variable that is expected to be central for understanding risk and protective factors for EDs and higher weight either directly or indirectly by playing a mediating role in terms of shaping internalization of body ideals or sociocultural influences. Furthermore, the results will clarify how the model pathways vary for emerging adult men and women as well as young adults from nine different countries. Importantly, this work represents collaborations from an interdisciplinary international team of scholars with a diversity of perspectives. It is expected that the findings will advance our common understandings of ways of preventing problematic behaviors and increasing well-being and move towards shared frameworks of both ED and higher weight.

The findings from this study will assist in the refinement of the conceptual model of ED and higher weight that can be adapted to generate useful empirical models across gender and different countries. The findings will also contribute to the identification of variables to

target in both prevention and intervention programs for ED and unhealthy weight control behaviors, as well as the promotion of health and well-being.

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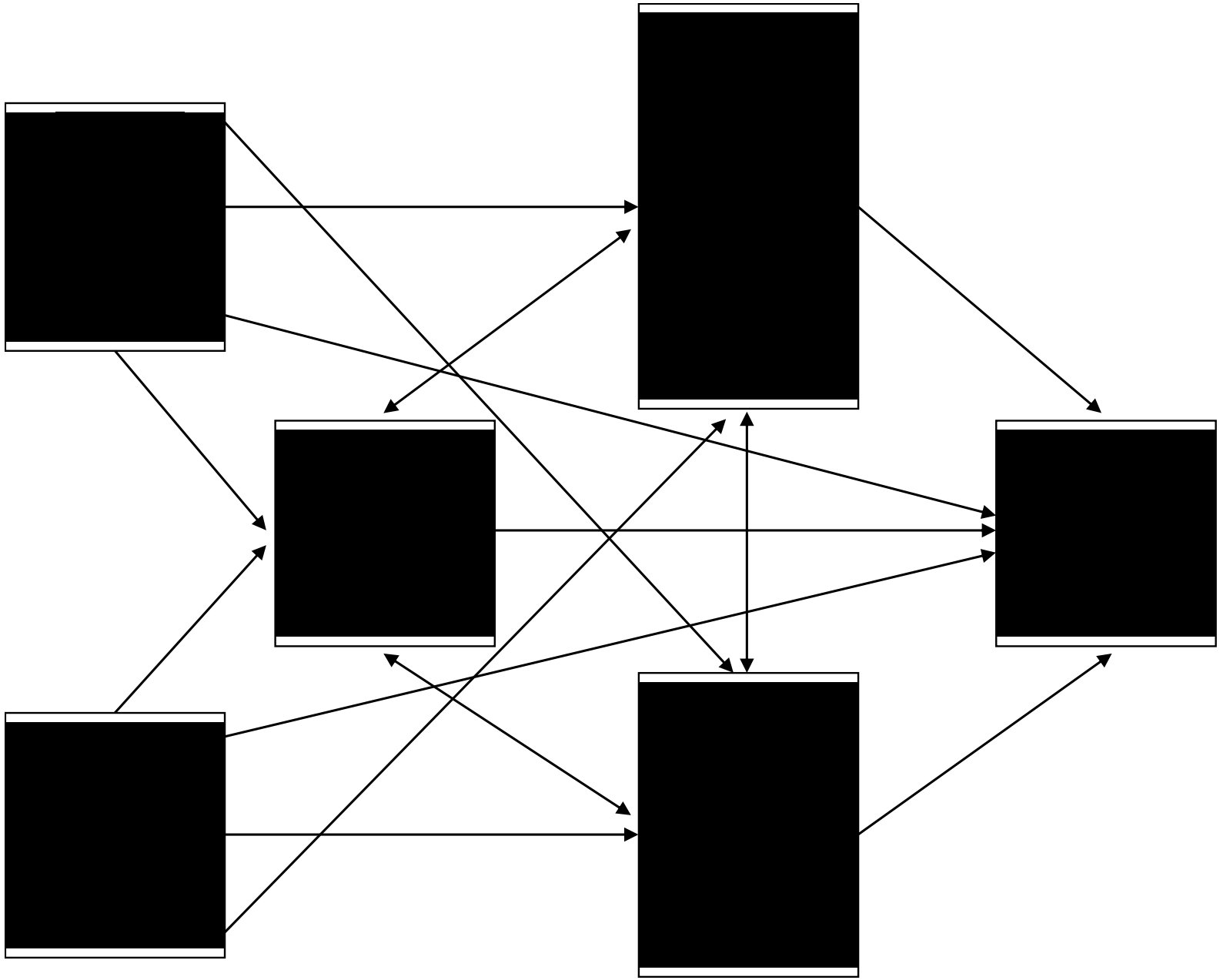

Figure 1. Conceptual model for shared risk and protective factors for eating disorders and higher weight in adults.